

REMARKS

This paper is being provided in response to the Final Office Action dated March 23, 2006, for the above-referenced application. In this response, Applicants have amended claim 27 to clarify that which Applicants consider to be the invention. Further, Applicants have amended the title for purposes of clarification. Applicants respectfully submit that the amendments to the claims are fully supported by the originally-filed specification.

Applicants thank the Examiner for the allowance of claims 1-7 and 20-26.

Concerning the objection to the title, Applicants have amended the title to remove the method for manufacturing language as required by the Examiner. Applicants submit that the title and abstract accurately and sufficiently “enable the United States Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure” in accordance with 37 C.F.R. 1.72. Accordingly, Applicants request that this objection be withdrawn.

The rejections of claim 27-29 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,649,961 to Estacio et al. (hereinafter “Estacio”) is hereby traversed and reconsideration is respectfully requested.

Independent claim 27, as amended herein, recites a semiconductor device that includes an interconnect layer provided over a semiconductor substrate, an electrically conductive anti-oxidizing layer formed over, and in contact with, a part of the interconnect layer and containing a

same element as an element in the interconnect layer that is chemically bonded or alloyed with a different element which is different from the element contained in the interconnect layer, and wherein said different element of said anti-oxidizing layer has a lower oxidation-reduction potential than that of said element contained in said interconnect layer. A bonding pad metal film is provided over the electrically conductive anti-oxidizing layer to form an electrical conduction with the interconnect layer. Claims 28-31 depend directly or indirectly on independent claim 27.

The Estacio reference discloses increasing the number of MOSFET gate bump to make MOSFET gate contacts more durable and reliable. Extension of the under-bump metal laterally from the gate contact with the gate pad metallization out to two or more gate pads overlying the source pad metallization reduces the risk of delamination of the metallization due to thermal and mechanical stresses in assembly and operation. The Office Action cites to element (43) as an interconnect layer, element (42) as an anti-oxidizing layer, and element (101) as a bonding pad metal film.

Applicants' independent claim 27, as amended, recites a semiconductor device having an interconnect layer and an anti-oxidizing layer formed over, in a contact with, a part of the interconnect layer and containing a same element as in the interconnect layer and a different element than is in the interconnect layer, disposed between the interconnect layer and a bonding pad metal film. The oxidation of the interconnect metal is effectively inhibited by the action and configuration of the anti-oxidizing layer, even when a part of the interconnect layer is exposed by the contact of the probe. Since the semiconductor device as presently claimed has the anti-

oxidizing layer between the interconnect layer and the protective film, even though the upper layer of the interconnect layer is damaged in the case of being poked with the probe and the surface of the interconnect layer is exposed, the different element in the anti-oxidizing layer, which is different from an element contained in the interconnect layer, is oxidized by containing the atmospheric air. Thus, the chemically stable layer that, for example, prevents the corrosion of copper is formed on the surface of the interconnect layer, and thereby inhibiting the deterioration of the semiconductor device.

The present claimed invention prevents the corrosion of the interconnect layer in the case of being poked with the probe, by providing the anti-oxidizing layer configured as claimed and formed over a part of the interconnect layer and underneath a bonding pad metal film. (See page 6, lines 9 - page 7, line 4 of the present application.) In particular, the anti-oxidizing layer configured as recited and including a same element as is in the interconnect layer that is chemically bonded or alloyed with a different element from the interconnect layer more surely inhibits the undesired corrosion because of the different element has a lower oxidation-reduction potential than the element in the interconnect layer. (See page 10, lines 4-11 and page 13, lines 10-24 of the present application.)

Applicants respectfully submit that Estacio does not teach or fairly suggest at least the above-noted features as claimed by Applicants. Specifically, the layer cited in the Office Action as the anti-oxidizing layer (element 42) is formed underneath the layer cited as the interconnect layer (element 43). As noted above, Applicants recite a semiconductor device configuration in which an anti-oxidizing layer is able to reduce or eliminate corrosion of an underlying

interconnect layer, because the anti-oxidizing layer is formed over the interconnect layer in a position suitable to address damage by a probe, for example, and includes a same element as an element of the interconnect layer bonded with a different element, which different element has a lower oxidation-reduction potential than the element of the interconnect layer. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 30 and 31 under 35 U.S.C. 103(a) as being unpatentable over Estacio in view of U.S. Patent No. 5,134,460 to Brady et al. (hereinafter “Brady”) is hereby traversed and reconsideration is respectfully requested.

The features of independent claim 27 are discussed above with respect to Estacio. Claims 30 and 31 depend therefrom.

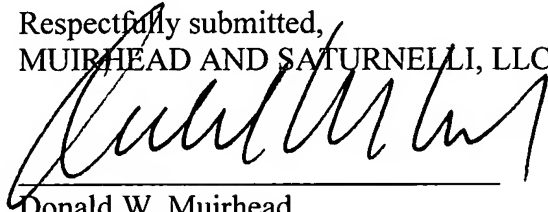
The Brady reference discloses an aluminum bump, reworkable bump, and titanium nitride structure for tab bonding. The Office Action cites Brady as disclosing a protective film comprising Ti or TiN and a solder ball adhered to a bonding metal film.

Applicants respectfully submit that Brady reference does not overcome the above-noted deficiencies of the Estacio reference with respect to Applicants’ claimed invention. Specifically, neither Estacio nor Brady, taken alone or in combination, teach or fairly suggest a semiconductor device including at least the features of an interconnect layer and an anti-oxidizing layer formed over, in a contact with, a part of the interconnect layer and containing a same element as in the interconnect layer and a different element than is in the interconnect layer, disposed between the

interconnect layer and a bonding pad metal film. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Based on the above, Applicants respectfully request that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 508-898-8603.

Respectfully submitted,
MUIRHEAD AND SATURNELLI, LLC



Donald W. Muirhead
Registration No. 33,978

Date: July 5, 2006

Customer No.: 26339

Muirhead and Saturnelli, LLC
200 Friberg Parkway, Suite 1001
Westborough, MA 01581
Phone: (508) 898-8601
Fax: (508) 898-8602